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Journal of Clinical and Laboratory Research
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Short Communication

Managing Type 2 Diabetes Mellitus: A Personalized Approach

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Received Date: August 11, 2023 | **Accepted Date:** August 25, 2023 | **Published Date:** September 08, 2023

Citation: Saliha Rizvi, Gowhar Rashid, (2023), Managing Type 2 Diabetes Mellitus: A Personalized Approach, *Journal of Clinical and Laboratory Research*. 6(3); **DOI:**10.31579/2768-0487/113

Abstract

Background: Type 2 diabetes (T2DM) prevalence and incidence are rising globally, especially in developing nations. With an expanding variety of pharmacological drugs now accessible, glycemic control in type 2 diabetes mellitus has become increasingly complicated and, to some degree, controversial. The situation calls for a switch to personalized medicine approach where the treatment strategy is tailored following an individual patient's genotype/phenotype and the management should often change over time owing to how diabetes evolves within individual patients.

Main Text: The clinical etiology, presentation, and complications of T2DM vary from person to person which makes the management of T2DM a much more challenging task for clinicians even after having several treatment options. A potential solution to improve outcomes and reduce costs in diabetes care, therefore, calls for a shift towards precision medicine Based on the contribution of multiple genetic factors in the etiology of T2DM and variable response to different anti-diabetic agents, the genetic architecture of each alters treatment efficacy. Using genetic information and calculating a genetic risk score, based on different genetic variants, may enable us to reclassify patients with T2DM in discrete pathophysiological subgroups, to apply targeted preventive or therapeutic interventions which will eventually increase drug efficacy and decrease adverse drug reactions. To provide our patients with the best therapeutic strategy and follow-up, diagnostic tools for identifying diabetes subtypes must be created and incorporated into clinical practice.

Conclusion: Thus, retrospectively assessing a stratified strategy to therapy ushers in a new era of personalized medicine in T2DM, should include ongoing discovery, societal determinants of health, and healthcare change which will help in improving the quality of life of T2DM patients and offer them better treatment care with minimum side effects and better efficacy.

Key words: T2DM; personalized medicine; therapy; genetics; genetic variants

Introduction

Type 2 diabetes (T2DM) prevalence and incidence are rising globally, especially in developing nations. With an expanding variety of pharmacological drugs now accessible, glycemic control in type 2 diabetes mellitus has become increasingly complicated and, to some degree, controversial. The situation calls for a switch to personalized medicine approach where the treatment strategy is tailored following an individual patient's genotype/phenotype and the management should often change over time owing to how diabetes evolves within individual patients.

Main Text

In the last few decades, type 2 diabetes mellitus (T2DM) has become a widespread epidemic. In 2015, there were 415 million cases of T2DM, and by 2040, that number is projected to rise to 642 million. [1]. Long-standing uncontrolled glucose levels are associated with various microvascular damage and complications in the eyes, kidneys, nerves, and heart thus affecting the quality of life and ultimately death in most cases. The clinical etiology, presentation, and complications of T2DM vary from person to person which makes the management of T2DM a much more challenging task for clinicians even after having several treatment options. These differences in response to oral hypoglycemic drugs amongst T2DM patients pose a major hurdle in disease management and interestingly up to 40% of these inter-individual variabilities are affected by genetic factors [2]. A potential solution to improve outcomes and reduce costs in diabetes care, therefore, calls for a shift toward precision medicine [3]. The American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) recently released a consensus report on precision medicine based on expert opinion [4]. Precision diabetes medicine refers to an approach to optimize the diagnosis, prediction, prevention, or treatment of

diabetes by integrating multidimensional data, accounting for individual differences. Precision medicine in diabetes makes use of an individual's unique genetic makeup, environment, or context data (which can be gathered from clinical records, wearable technology, genomics, and other 'omics data) to appreciate individual characteristics, differences, circumstances, and preferences [5]. The complicated T2DM pathogenesis, glucose balance, and its consequences are all influenced by several gene variations. Based on the contribution of multiple genetic factors in the etiology of T2DM and variable response to different anti-diabetic agents, the genetic architecture of each alters treatment efficacy. Using genetic information and calculating a genetic risk score, based on different genetic variants, may enable us to reclassify patients with T2DM in discrete pathophysiological subgroups, to apply targeted preventive or therapeutic interventions which will eventually increase drug efficacy and decrease adverse drug reactions. Recent research has demonstrated robust and clinically relevant differential drug response with all noninsulin treatments after metformin (sulfonylureas, thiazolidinediones, dipeptidyl peptidase 4 [DPP-4] inhibitors, glucagon-like peptide 1 [GLP-1] receptor agonists, and sodium–glucose cotransporter 2 [SGLT2] inhibitors) using routinely available clinical features.

Sulfonylureas that target the KCNJ11 genetic variant are among the finest illustrations of how precision medicine can be used to great effect. Regardless of the presence of a KRAS mutation, it has been found that metformin increases the anticancer activity of MEK inhibitors in human LKB1 wild-type non-small cell lung cancer (NSCLC) cell lines by downregulating GLI1 and reducing NF-kB (p65)-mediated production of MMP2 and MMP9 [6]. To assess the safety and efficacy of metformin and erlotinib used in combination for second-line therapy of patients with stage IV NSCLC whose tumors showed the wild-type EGFR gene, the METAL trial was created [7]. Therefore, a multifactorial strategy that is interwoven with experiment findings might lead to improved diabetic results to offer newer insights. The Human Gene Mutation Database and ClinVar are just two databases that have been created in recent years through data exchange [8,9]. Precision T2D prevention does not contemplate acting in all prediabetic patients because it is not cost-effective, but rather on a subgroup of prediabetic patients selected based on other pertinent risk factors (lifestyle, socioeconomic status, family history of diabetes, ethnicity, overweight–obesity, signs of insulin resistance, genetics). A "one-size-fits-all" lifestyle strategy is ineffective for everyone and cannot be maintained because T2DM groups have varied phenotypic and genotypic characteristics [4]. Precision diagnoses, prophylaxis, prognostics, and treatment are made possible by comprehensive phenotyping and genotyping of T2DM patients in the prediabetic stage. Professionals in the medical field can use computerized medical records that contain people's full omics data, such as genetics, proteomics, metabolomics, and transcriptomics. The possible useful information gleaned from T2DM patients can then be used to decide on therapeutic optimization. To support these initiatives, we need to establish joint alliances with stakeholders (patient organizations, product firms, private and public backers of research, doctors, educators, and policymakers) and develop tools for collecting and analyzing patient data [4]. To provide our patients with the best therapeutic strategy and follow-up, diagnostic tools for identifying diabetes subtypes must be created and incorporated into clinical practice. Thus, given the remarkable progress achieved in recent years, it is fair to predict that "personalized diabetology" will become more widely used in T2DM in the years to come.

Ethics approval and consent to participate: Not Applicable

Consent for publication: Not Applicable

Availability of data and material: Not Applicable

Competing interests: The authors declare that they have no competing interests

Funding: None.

Authors' contributions: SR contributed to the theme and writing; GR contributed to writing and critical reviewing

Acknowledgements: We are thankful to Era University for supporting us in our endeavours.

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DOI:10.31579/2768-0487/113